CLAIMS

What is claimed is:

1. A method of code programming a ROM device in which predetermined cells are coded with substantially identical implantation doses, the method comprising:

(a) forming at least one semi-manufactured ROM device having a plurality of gates;

(b) forming a pattern of pre-code openings;

(c) forming a pattern of real-code openings over the pattern of pre-code openings; and

(d) implanting a tuned dosage of ions through intersections of the real-code openings and the pre-code openings.

2. The method as set forth in claim 1, wherein:

the plurality of gates have substantially identically designed gate widths;

each pre-code opening is positioned over a word line and between two adjacent bit lines intersecting a word line; and

intersections between the real-code openings and pre-code openings have substantially identical openings.

3. The method as set forth in Claim 2, wherein:

the pre-code openings have substantially identical sizes;

the real-code openings have substantially identical sizes; and

the real-code openings are fewer in number than the pre-code openings.

4. The method as set forth in Claim 3, wherein:

the step of forming a pattern of pre-code openings comprises forming a first photoresist layer over the semi-manufactured ROM device and selectively exposing the first photoresist layer to develop the pattern of pre-code openings; and

the step of forming a pattern of real-code openings comprises forming a second photoresist layer over the first photoresist layer and selectively exposing the second photoresist layer to develop the pattern of real-code openings.

5. The method as set forth in Claim 4, further comprising the step of:

hardening the first photoresist layer subsequent to forming the pattern of pre-code openings.

6. The method as set forth in Claim 5, wherein hardening the first photoresist layer comprises implanting the first photoresist layer with a tuned dosage or processing the first photoresist layer in a plasma etcher.

7. The method as set forth in Claim 3, wherein the pre-code openings have widths, measured in a gate width direction, that are greater than widths of gates over which the pre-code openings are formed.

8. The method as set forth in Claim 7, wherein the real-code openings have sizes greater than the pre-code openings.

9. The method of Claim 8, wherein (c) and (d) are repeated in accordance with desired threshold voltages.

10. The method as set forth in Claim 7, wherein the real-code openings and the pre-code openings have substantially the same sizes.

11. The method of claim 7, wherein the real-code openings are smaller in size than the pre-code openings.

12. The method as set forth in Claim 3, wherein forming the pre-code openings comprises the steps of:

forming an oxide layer over the plurality of gates;

forming a first photoresist layer patterned with the pre-code pattern over the oxide layer; and

etching the oxide layer and removing the first photoresist layer.

13. The method as set forth in claim 12, wherein the method further comprises the steps of:

after removing the first photoresist layer, forming a sacrificial layer over the pre-code pattern; and

planarizing the sacrificial layer.

14. The method as set forth in claim 13, wherein planarizing the sacrificial is performed by CMP or by etch back.

15. The method as set forth in claim 13, wherein exposed portions of the sacrificial layer are removed after forming the real-code openings.

16. The method as set forth in Claim 3, wherein (a) further includes forming an antireflective coating.

17. The method as set forth in Claim 3, wherein:

the substantially identical implantation doses are the same, the substantially identically designed gate widths are the same; the pre-code opening sizes are the same, and the real-code opening sizes are the same; and

channels of gates underneath the intersecting real-code and pre-code openings receive the same doses of ions at (d) through identically sized openings of the pattern of pre-code openings; and

channels of gates not underneath the intersecting real-code and pre-code openings do not receive doses of ions at (d).

18. The method as set forth in Claim 3, wherein the at least one semi-manufactured ROM device comprises a plurality of semi-manufactured ROM devices and the plurality of gates comprises substantially all gates of the semi-manufactured ROM device.

19. The method as set forth in Claim 3, wherein between (b) and (c) the ROM structure is stored and then retrieved for additional processing.

20. A ROM device formed using the method of Claim 3, wherein the pattern of pre-code openings and the pattern of real-code openings overlap vertically and are disposed on different planes.

21. A method of code programming a ROM device in which predetermined cells are coded with substantially identical implantation doses, the method comprising:

(a) forming at least one semi-manufactured ROM device having a plurality of gates with substantially identically designed gate widths;

(b) forming a pattern of real-code openings;

(c) forming a pattern of pre-code openings therein; and

(d) implanting a tuned dosage of ions through intersections of the pre-code openings and the real-code openings, the intersections having substantially identical sizes.

22. The method as set forth in Claim 21, wherein:

each real-code opening is substantially identically sized relative to the other real-code openings;

the pre-code openings have substantially identical sizes; and

the real-code openings are fewer in number than the pre-code openings.

23. The method of claim 22, wherein:

the step of forming a pattern of real-code openings comprises forming a first photoresist layer over the semi-manufactured ROM device and selectively exposing the first photoresist layer to develop the pattern of real-code openings; and

the step of forming a pattern of pre-code openings comprises forming a second photoresist layer over the first photoresist layer and selectively exposing the second photoresist layer to develop the pattern of pre-code openings..

24. The method as set forth in Claim 23, further comprising the step of:

hardening the first photoresist layer subsequent to forming the pattern of pre-code openings.

25. The method as set forth in Claim 24, wherein hardening the first photoresist layer comprises implanting the first photoresist layer with a tuned dosage or processing the first photoresist layer in a plasma etcher.

26. The method as set forth in Claim 22, wherein the pre-code openings have widths, measured in a gate width direction, that are greater than widths of gates over which the pre-code openings are formed.

27. The method as set forth in Claim 26, wherein the real-code openings have sizes greater then the pre-code openings.

28. The method of Claim 27, wherein (b), (c) and (d) are repeated in accordance with desired threshold voltages.

29. The method as set forth in Claim 26, wherein the real-code openings and the pre-code openings have substantially the same sizes.

30. The method of Claim 29, wherein (b), (c) and (d) are repeated in accordance with desired threshold voltages.

31. The method of claim 26, wherein the real-code openings are smaller in size than the pre-code openings.

32. The method as set forth in Claim 22, wherein forming the pre-code openings comprises the steps of:

forming an oxide layer over the plurality of gates;

forming a first photoresist layer patterned with the pre-code pattern over the oxide layer; and

etching the oxide layer and removing the first photoresist layer.

33. The method as set forth in claim 32, wherein the method further comprises the steps of:

after removing the first photoresist layer, forming a sacrificial layer over the pre-code pattern; and

planarizing the sacrificial layer.

34. The method as set forth in claim 33, wherein planarizing the sacrificial is performed by CMP or by etch back.36. The method as set forth in claim 34, wherein exposed portions of the sacrificial layer are removed after forming the real-code openings.

35. The method as set forth in Claim 22, wherein (a) further includes forming an antireflective coating.

36. The method of Claim 22, wherein:

the substantially identical implantation doses are the same, the substantially identically designed gate widths are the same; the pre-code opening sizes are the same, and the real-code opening sizes are the same; and

channels of gates underneath the intersecting real-code and pre-code openings receive the same doses of ions at (d) through identically sized openings of the pattern of pre-code openings; and

channels of gates not underneath the intersecting real-code and pre-code openings do not receive doses of ions at (d).

37. A ROM device formed using the method of Claim 36, wherein the pattern of real-code openings and the pattern of pre-code openings overlap vertically and lie at different photoresist planes.

38. The method as set forth in Claim 22, wherein the at least one semi-manufactured ROM device comprises a plurality of semi-manufactured ROM devices, and the plurality of gates comprises substantially all gates of the semi-manufactured ROM device.